10. (Amended) The device of claim 1, [wherein said at least 1 wall is contained in a layer that is separate from the layer that contains said reflecting element] comprising: a first layer that contains said support structure; and a second layer that contains said reflecting element.

14. (Amended) A micromirror device comprising:
a reflecting element that can be deflected into at least 2 states;
a support structure other than a post for supporting said reflecting element, said support structure comprising at least 1 wall, wherein said support structure is in direct contact with said reflecting element; and
a deformable element that is connected to said support structure.

19. (Amended) A micromirror device comprising:
a reflecting element that can be deflected into at least 2 states;
a 1st support structure other than a post for supporting said reflecting element, said 1st support structure comprising at least 1 wall, wherein said 1st support structure is sufficient to support said reflecting element and said 1st support structure is in direct contact with said reflecting element;
a torsion hinge that is connected to said 1st support structure; and
a 2nd set of support structures that is different than said 1st support structure for supporting said torsion hinge, said 2nd set of support structures defining an axis of rotation of said torsion hinge.

28. (Amended) A micromirror device comprising:
a reflecting element that can be deflected into at least 2 states;
a 1st support structure other than a post for supporting said reflecting element, said 1st support structure comprising at least 1 wall, wherein said 1st support structure is sufficient to support said reflecting element and said 1st support structure is in direct contact with said reflecting element;
a deformable element that is connected to said 1st support structure;
a 2nd set of support structures that is different than said 1st support structure for supporting said deformable element; and
a base layer for supporting said 2nd set of support structures, said base layer having a 1st surface and a 2nd surface, with said 1st surface facing said reflecting element.

REMARKS

Claims 1, 2, 5, and 6 have been rejected under 35 U.S.C. 102(e) as being anticipated by Patel et al. (U.S. Patent 6,885,494 B2). The Examiner notes that Patel et al. disclose a micromirror structure with reference to Fig. 2c in Patel et al. Patel et al. state (col. 5, lines 17-19): "Referring to FIG. **2**c, the basic configuration of the micro-mirror comprises substrate **100**, hinge posts **120**, a hinge that is hide under the posts and mirror plate **110**." With respect to Fig. 2c of Patel et al., the word "wall" or "walls" is not mentioned. Furthermore, the word "wall" or "walls" is not mentioned anywhere in Patel et al. Therefore Patel et al. do not teach the concept of using a wall or walls to construct

support structures other than posts. Nowhere do Patel et al. teach any of the support structures illustrated in Figs. 6A-6L and Figs. 7A-7C of the present application.

In Fig. 10 of Patel et al., a perspective view of the hinge posts is clearly shown. Patel et al. state (col. 8, lines 65-67; col. 9, lines 1-2): "The hinge structure and the mirror plate can be formed on a substrate as shown in FIG. **10**. According to an embodiment of the invention, substrate **110** is a light transmissive substrate such as quartz or glass. Two posts **440**a and **440**b of the hinge structure are formed on the substrate." For convenience, Fig. 10 of Patel et al. is reproduced below.

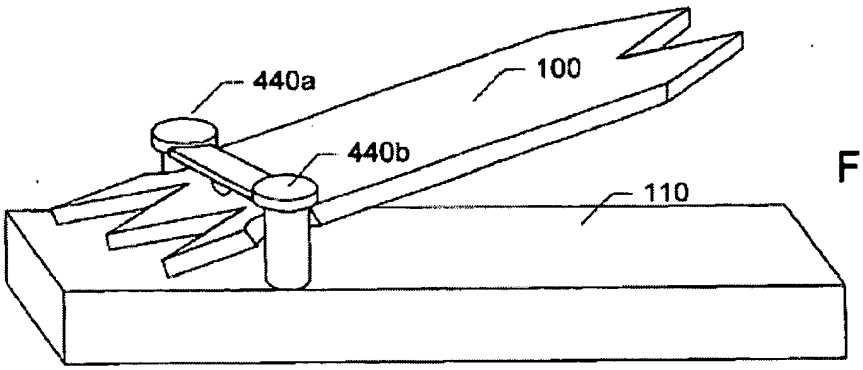

FIG. 10

Fig. 10 of Patel et al. U.S. Patent 6,885,494 B2

Patel et al. teach micromirror devices that require 2 posts to support each reflecting element, as shown clearly in Fig. 10 above and as also explained with reference to Fig. 2c: "Referring to FIG. **2**c, the basic configuration of the micro-mirror comprises, substrate **100**, hinge posts **120**...." Two posts are required because a first post is located near a first edge of the reflecting element and a second post is located near a second edge of the reflecting element. In contrast to Patel et al., the present application discloses micromirror devices in which only one support structure other than a post is required to support the reflecting element. In other words, according to the present invention, one support structure other than a post is sufficient for supporting the reflecting element. Only one support structure is necessary because it is generally located near the center of the reflecting element, as shown for example in Fig. 9B. For convenience Fig. 9B of the present application is shown below. Therefore, the teachings of Patel et al. do not anticipate all of the features set forth in claim 1.

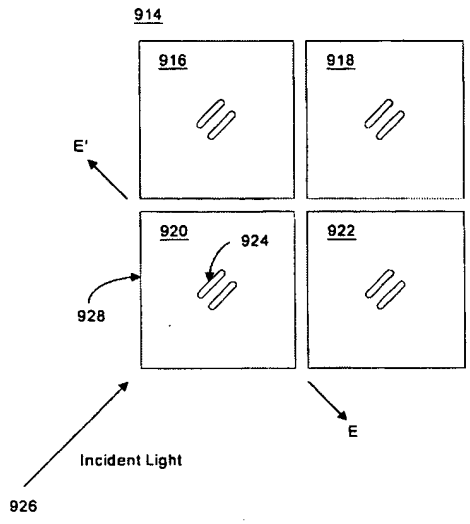

Fig. 9B

Fig. 9B of present application 10/763,672

Fig. 10 of Patel et al. shows 2 posts having a circular cross-sections. Similarly, as illustrated in Fig. 2 and described in paragraph [0004] of the present application, a prior art micromirror support structure is a post having a square cross section. For convenience, Fig. 2 is reproduced below. The support posts are labeled **210**, **212**, **214**, and **216**.

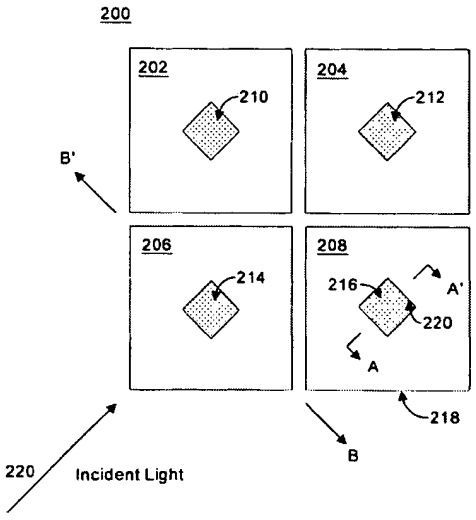

Fig. 2 (Prior Art)

Fig. 2 (prior art) of present application 10/763,672

In contrast, the present application discloses support structures other than posts comprising at least 1 wall. Exemplary support structures are illustrated in Figs. 6A-6L and Figs. 7A-7C and are described in paragraphs [0044] through [0048] (as originally filed, paragraphs [0054] through [0058] in U.S. Patent Application Publication

2005/0162727 A1). None of the exemplary support structures (Figs. 6A-6L and Figs. 7A-7L) is a post. The prior art support structures are posts, i.e. have a cross sectional shape of a square, circle, or other closed shape having an anisotropy ratio of less than about 1.5 (as discussed in paragraphs [0015] and [0016]). In contrast, the inventive support structures are support structures other than posts. An example of an inventive support structure is the H-shaped structure shown in Fig. 6C.

Yet furthermore, all of the preferred embodiments that are disclosed by the present application describe support structures other than posts, comprising at least 1 wall, wherein the support structure is in direct contact with the reflecting element and directly supports the reflecting element. In contrast, Patel et al. disclose micromirror devices wherein 2 posts support a torsion hinge, and the torsion hinge supports the reflecting element. Therefore, in the devices taught by Patel et al., the posts are not in direct contact with the reflecting element and the posts indirectly support the reflecting element. The teachings of Patel et al. do not anticipate the inventive micromirror devices.

Accordingly, in order to more clearly distinguish the inventive support structures from prior art structures, claim 1 has been amended to require that the support structure be a support structure other than a post, comprising at least 1 wall, wherein the support structure is in direct contact with the reflecting element and the support structure is sufficient for supporting the reflecting element. Withdrawal of the rejection of claims 1, 2, 5, and 6 is therefore respectfully requested.

Claims 7-10 have been rejected under 35 U.S.C. 102(e) as being anticipated by Patel et al. (U.S. Patent 6,885,494 B2). In a passage that is cited by the Examiner (col. 6, lines 8-12), Patel et al. state: "In addition, the incident light angle α (e.g. the angle between the incident light direction and normal direction **102**a of micro-mirror **110**) is preferably 28° or more. And the incident light angle can also be 30° or more, or even 36° or more." The incident light angle α is illustrated in Fig. 2c of Patel et al. and is reproduced below for convenience.

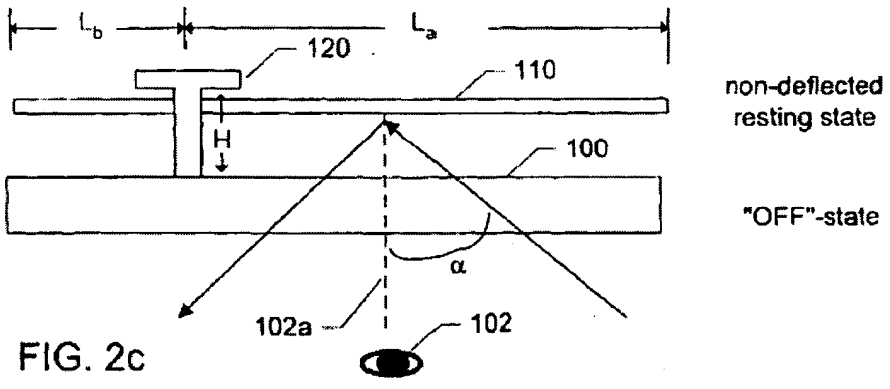

Fig. 2c of Patel et al. US 6,885,494 B2

It can be seen that the incident light angle α is the angle between the projection of the incident light propagation vector on to the plane ***perpendicular*** to the reflective surface of the reflecting element (i.e. on the plane of this page) and the vector normal (**102**a) to the reflecting surface of the reflecting element. In contrast, claim 7 refers to "the angle between the projection of the incident light propagation vector onto the plane of the reflective surface of said reflecting element and a wall segment of said at least 1 wall...." Therefore, the incident light angle α according to Patel et al. and the angle as set forth in claim 7 are different. Withdrawal of the rejection of claim 7 is therefore respectfully requested.

Furthermore, claims 8 and 9 have been rejected under 35 U.S.C. 112 as having insufficient antecedent basis for the limitation for "the angle." Claims 8 and 9 have been amended to be dependent on claim 7 instead of on claim 1. Withdrawal of the rejection of claims 8 and 9 is therefore respectfully requested.

Furthermore, claim 10 has been rejected under 35 U.S.C. 112 as having insufficient antecedent basis for the limitation for "the layer that contains said reflecting element." Claim 10 has been amended to set forth a first layer that contains the support structure and a second layer that contains the reflecting element. Withdrawal of the rejection of claim 10 is therefore respectfully requested.

Claim 19 has been rejected under 35 U.S.C. 102(e) as being anticipated by Patel et al. (U.S. Patent 6,885,494 B2). As discussed above with respect to claim 1, Patel et al. teach micromirror devices that require 2 posts to support each reflecting element, whereas the present application discloses micromirror devices in which only one support structure other than a post is required to support the reflecting element. In other words, according to the present invention, one support structure other than a post is sufficient for supporting the reflecting element. Furthermore, as discussed above with respect to claim 1, Patel et al. disclose support posts whereas the present application discloses support structures other than posts comprising at least 1 wall. Nowhere do Patel et al. teach any of the support structures illustrated in Figs. 6A-6L and Figs. 7A-7C of the present application.

Yet furthermore, all of the preferred embodiments that are disclosed by the present application describe support structures other than posts, comprising at least 1 wall, wherein the support structure is in direct contact with the reflecting element and directly supports the reflecting element. In contrast, Patel et al. disclose micromirror devices wherein 2 posts support a torsion hinge, and the torsion hinge supports the reflecting element. Therefore, in the devices taught by Patel et al., the posts are not in direct contact with the reflecting element and the posts indirectly support the reflecting element.

Yet furthermore, as clearly shown in Fig. 10 of Patel et al., Patel et al. disclose a micromirror device in which the 2 posts (440a and 440b) support **both** the torsion hinge **and** the reflecting element. In contrast, the present application discloses a micromirror device in which a 1st support structure other than a post supports the reflecting element and a 2nd set of support structures that is different than the 1st support structure supports

the torsion hinge. Therefore, the teachings of Patel et al. do not anticipate the inventive micromirror devices. Accordingly, in order to more clearly distinguish the present invention from the prior art, claim 19 has been amended to require the following: 1) the 1st support structure is a support structure other than a post, comprising at least 1 wall, wherein the 1st support structure is sufficient to support the reflecting element and the 1st support structure is in direct contact with the reflecting element; 2) the 2nd set of support structures for supporting the torsion hinge is different than the 1st support structure. Withdrawal of the rejection of claims 19 is therefore respectfully requested.

Claims 20-27 have been rejected under 35 U.S.C. 102(e) as being anticipated by Patel et al. (U.S. Patent 6,885,494 B2). We believe that the in view of the amendment to claim 19, claims 20-27 are allowable in the present form. Furthermore, with respect to claim 21, Patel et al. do not teach various possible shapes for the 2nd set of support structures such as triangles, polygons, ellipses, and circles. Withdrawal of the rejection of claims 20-27 is therefore respectfully requested.

Claim 28 has been rejected under 35 U.S.C. 102(e) as being anticipated by Patel et al. (U.S. Patent 6,885,494 B2). As discussed above with respect to claim 1, Patel et al. teach micromirror devices that require 2 posts to support each reflecting element, whereas the present application discloses micromirror devices in which only one support structure other than a post is required to support the reflecting element. In other words, according to the present invention, one support structure other than a post is sufficient for supporting the reflecting element. Furthermore, as discussed above with respect to claim 1, Patel et al. disclose support posts whereas the present application discloses support structures other than posts comprising at least 1 wall. Nowhere do Patel et al. teach any of the support structures illustrated in Figs. 6A-6: and Figs. 7A-7L of the present application. The teachings of Patel et al. do not anticipate the inventive support structures.

Yet furthermore, as discussed with respect to claim 19 above, Patel et al. disclose a micromirror device in which the 2 posts support **both** the torsion hinge **and** the reflecting element. In contrast, the present application discloses a micromirror device in which a 1st support structure other than a post supports the reflecting element and a 2nd set of support structures that is different than the 1st support structure supports the torsion hinge. Therefore, the teachings of Patel et al. do not anticipate the inventive micromirror devices. Accordingly, in order to more clearly distinguish the present invention from the prior art, claim 28 has been amended to require the following: 1) the 1st support structure is a support structure other than a post, comprising at least 1 wall, wherein the 1st support structure is sufficient to support the reflecting element and the 1st support structure is in direct contact with the reflecting element; 2) the 2nd set of support structures for supporting the deformable element is different than the 1st support structure. Withdrawal of the rejection of claims 28 is therefore respectfully requested.

Claims 29-36 have been rejected under 35 U.S.C. 102(e) as being anticipated by Patel et al. (U.S. Patent 6,885,494 B2). We believe that the in view of the amendment to

claim 28, claims 29-36 are allowable in the present form. Withdrawal of the rejection of claims 29-36 is therefore respectfully requested.

Claims 14-18 have been rejected under 35 U.S.C. 102(b) as being anticipated by Hornbeck (U.S. Patent 5,061,049 A). In particular, the Examiner cites Fig. 1A in Hornbeck. Figs. 1A, 1B, and 1C are reproduced below for convenience.

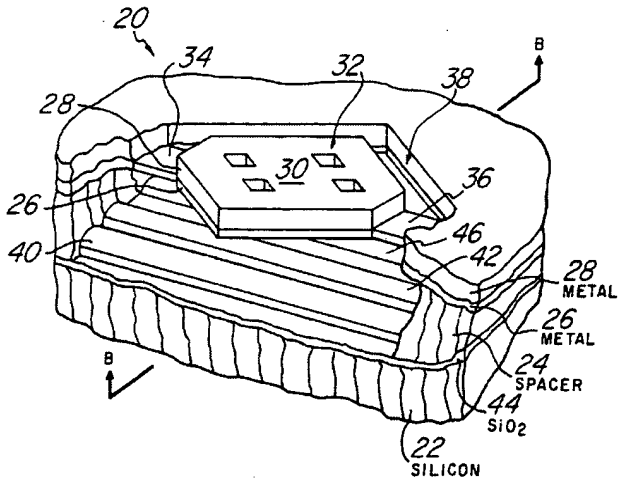

Fig. 1a

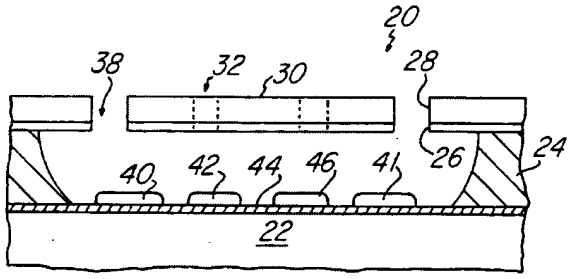

Fig. 1b

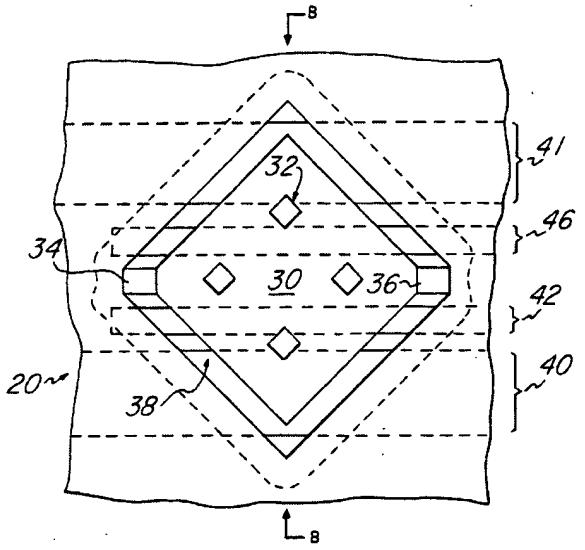

Fig. 1c

Figs. 1A, 1B, and 1C from Hornbeck U.S. Patent 5,061,049

In the following statement, Hornbeck teaches that the deformable element (item 30) is formed in layers 26 and 28. Hornbeck states (col. 9, lines 37-52): "A first preferred embodiment single pixel of a DMD fabricated by a first preferred embodiment method is illustrated in perspective view in FIG. **1**A, in cross sectional elevation in FIG. **1**B, and in plan view in FIG. **1**C. The pixel, generally denoted **20**, is basically a beam (flap) covering a shallow well and includes silicon substrate **22**, insulating spacer **24**, metal hinge layer **26**, metal beam layer **28**, beam **30** formed in layers **26-28**, and plasma etch access holes **32** in beam **30**. The portions **34**, **36** of hinge layer **26** that are not covered by beam layer **28** form torsion hinges (torsion rods) attaching beam **30** to the portion of layers **26-28** supported by spacer **24**. Electrodes **40**, **42**, **46** and **41** run between spacer **24** and substrate **22** and are isolated from substrate **22** by silicon dioxide layer **44**. FIG. **1**B is a cross section along line B-B as indicated in FIGS. **1**A and **1**C."

Furthermore, Hornbeck teaches that the layers 26 and 28 are aluminum alloy layers. Therefore, the deformable element (item 30) comprises an **aluminum alloy**. Hornbeck states (col. 10, lines 7-20): "Spacer **24** is positive photoresist which is an insulator; hinge layer **26** and beam layer **28** are both an aluminum, titanium, and silicon alloy (Ti:Si:Al) with 0.2% Ti and 1% Si. This alloy has a coefficient of thermal expansion not drastically different from spacer **24** and thus minimizes the stress between the metal layers and spacer **24** generated during the fabrication process described in the following; also, the two layers **26** and **28** being the same metal minimizes stress. Note that any stress between layers in the beam or hinge would cause warping or curling of the beam or hinge, and any stress between the metal and the spacer can cause buckling or warping of the free portion of the metal over the well."

Therefore, with respect to claims 17 and 18, we respectfully disagree with the assertion by the Examiner that Hornbeck discloses a deformable element comprising

crystalline semiconductor material, since aluminum alloy is not crystalline semiconductor material.

The Examiner has pointed out that Hornbeck's Fig. 1A shows a spacer (item 24) that functions as a support structure for the reflecting element (item 30). In Hornbeck's Fig. 1A, the spacer (item 24) supports the deformable element (item 36), which in turn supports the reflecting element (item 30). Therefore, the spacer (item 24) is not in direct contact with the reflecting element (item 30).

The Examiner asserts that the spacer (item 24) is a wall. However, the spacer (item 24) does not conform to the description of a wall according to the present application. In paragraph [0018] of the present application, a wall is described as having 3 dimensions: a height H (along the z-axis, the direction of the downward force of the load), a length L, and a thickness T, wherein thickness T is substantially smaller than length L. With reference to Hornbeck's Fig. 1C, it can be seen that Hornbeck's spacer has an approximately square outline. If the spacer were a wall, wall length L would correspond to the length of one of the sides of this square. If the spacer were a wall, wall height H would correspond to the spacer layer thin film thickness. If the spacer were a wall, wall thickness T would correspond to the distance from a side of the square to the closest side of an adjacent micromirror device. However, since Figs. 1A and 1C do not illustrate any adjacent micromirror devices and Hornbeck does not disclose preferred distances to adjacent micromirrors, the quantity thickness T can be neither ascertained nor estimated based on Hornbeck's teachings. Therefore, Hornbeck's teachings do not anticipate the wall as set forth in claim 14 of the present application. Nowhere does Hornbeck teach any of the support structures illustrated in Figs. 6A-6L and Figs. 7A-7C of the present application. The teachings of Hornbeck do not anticipate the inventive micromirror devices.

Yet furthermore, all of the preferred embodiments that are disclosed by the present application describe support structures other than posts, comprising at least 1 wall, wherein the support structure is in direct contact with the reflecting element and directly supports the reflecting element. In contrast, in the devices taught by Hornbeck, the spacer is not in direct contact with the reflecting element and the spacer indirectly supports the reflecting element. The teachings of Hornbeck do not anticipate the inventive micromirror devices. Accordingly, in order to more clearly distinguish the present invention from the prior art, claim 14 has been amended to require that the support structure be a support structure other than a post, comprising at least 1 wall, wherein the support structure is in direct contact with the reflecting element. Withdrawal of the rejection of claims 14-18 is therefore respectfully requested.

Claims 10-13 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Patel et al. (U.S. Patent 6,885,494 B2), as applied to claim 1 above, in view of Min (U.S. Patent 5,886,811 A). We believe that the in view of the aforementioned amendment to claim 1, claims 10-13 are allowable in the present form. Withdrawal of the rejection of claims 10-13 is therefore respectfully requested.

Claim 3 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Patel et al. (U.S. Patent 6,885,494 B2), as applied to claim 1 above, in view of Patel et al. (U.S. Patent 6,867,897 B1). We believe that the in view of the aforementioned amendment to claim 1, claim 3 is allowable in the present form. Withdrawal of the rejection of claim 3 is therefore respectfully requested.

Claim 4 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Patel et al. (U.S. Patent 6,885,494 B2), as applied to claim 1 above, in view of Huibers (U.S. Patent 6,356,378 B1). We believe that the in view of the aforementioned amendment to claim 1, claim 4 is allowable in the present form. Withdrawal of the rejection of claim 4 is therefore respectfully requested.

The Applicants believe that all pending claims are allowable and respectfully request a Notice of Allowance for this application from the Examiner. Should the Examiner believe that a telephone conference would expedite the prosecution of this application, the undersigned can be reached at the telephone number (408) 252-7814, Pacific time.

Respectfully submitted,

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